

[News story: Robotics and AI: projects to create safer work for people](#)

UK businesses and researchers will share £68 million with the aim of supporting safer working practices for people in extreme environments that could prevent potential harm and increase productivity.

The projects will each support the research and development of robotics and artificial intelligence (AI) technologies for use in industries such as offshore and nuclear energy, space and deep mining.

Minister of State for Climate Change and Industry, Claire Perry, announced the funding today at [Innovate 2017](#). It is part the government's £93 million programme for robotics and AI in extreme environments, which is being funded through the Industrial Strategy Challenge Fund.

Across research and innovation

Investing in business

Innovate UK is giving funding to a range of projects for robotics and AI systems development. £16.5 million will be shared between 70 businesses, 13 universities and 10 research organisations for collaborative research and development projects. A further £3 million will go to 17 demonstrator feasibility studies.

Some of the projects include:

- using autonomous submarines to determine the ice risk hazards for shipping or the installation of energy assets in the Arctic. Project lead, [Thurn Group](#) will use autonomous vessels to survey ice retreat to better understand the threats of the surviving ice, to plot when it's safe for people to use shipping routes or install or make changes to infrastructure
- integrating autonomous drones to inspect offshore-wind farms. Currently, a boat with crew has to go out to each turbine to carry out inspection and assess blade faults. A system that automatically deploys and recovers drones for monitoring would remove the need to send people into potentially dangerous seas or oceans while reducing costs and time. [Perceptual Robotics](#) are the lead
- manufacturing in space, such as the potential for in-orbit manufacture. This could be used for small replacement parts and tools, and possibly even large structures and spacecraft. [BAE Systems](#) are the lead

[Robotics and AI in extreme environments. ISCF winners: Perceptual Robotics.](#)

Ruth McKernan, Chief Executive of Innovate UK, said:

These pioneering projects driven by the very best minds in UK research and industry exemplify the huge potential of what can be achieved through the Industrial Strategy Challenge Fund and the long-term benefits for the UK economy.

These are just the first competitions in robotics and AI. There will be further opportunities for businesses in the coming months.

[Robotics and AI in extreme environments. ISCF winners: Thurn Group.](#)

Hubs for research

A £44.5 million investment will be made into 4 research hubs for world-leading research and robotic solutions. This will be managed by the [Engineering and Physical Sciences Research Council](#) (EPSRC). Commercial and international partners will support with an additional £51.6 million investment.

The hubs will lead investigations in the areas of off-shore energy, nuclear energy and space, opening up new cross-disciplinary opportunities which are not currently available. The [UK Space Agency](#) is co-funding one of the hubs.

Professor Philip Nelson, EPSRC Chief Executive, said:

The robotics hubs will draw on the country's research talent to nurture new developments in the field of robotics and provide the foundations on which innovative technologies can be built. The resulting outcomes from this research will allow us to explore environments that are too dangerous for humans to enter without risking injury or ill-health.

The Industrial Strategy Challenge Fund is helping us achieve a joined-up approach to research, discovery and innovation.

Sensors for the ocean

To develop sensors capable of working in the ocean, [Natural Environment Research Council](#) (NERC) is investing £4.3 million into 5 research projects by the [National Oceanography Centre](#), the [University of Exeter](#) and [University of Southampton](#).

The sensors will help researchers to answer questions about our changing oceans, such as how carbon dioxide moves between air and water, as well as monitoring the health of cold-water corals in marine protected areas. They will be compatible with existing marine robotic vehicles and those in development.

NERC's Chief Executive, Professor Duncan Wingham commented:

Sensors help us to better understand our oceans and manage them sustainably for the future.

The projects will develop ambitious new technologies that work in hazardous and extreme environments, maintaining the UK's world-class status in marine robotics. Other industries, such as the water, aquaculture and industrial waste, are also likely to benefit.

About the Industrial Strategy Challenge Fund

The Industrial Strategy Challenge Fund is part of government's Industrial Strategy, which will ensure the UK continues to be one of the best places in the world for science and innovation.

Innovate UK and the Research Councils are taking a leading role in delivering this funding across the country. This will allow the UK to secure maximum benefit.

Research and analysis: Soil screening values for assessing ecological risk

This project has produced guidelines for screening the risks to soils from chemicals released through the landspreading of waste-derived materials.

The project reviewed the available evidence on the direct terrestrial ecotoxicity and potential for secondary poisoning of 38 chemical substances and mixtures, including 23 trace elements and 15 persistent organic pollutants. Although there were insufficient data to derive an assessment criterion in all cases, soil screening values are recommended in the report for 9 trace elements and 8 organic pollutants. A spreadsheet tool allows the screening values to be adjusted for site-specific soil properties.

The soil screening values developed through this project will help the Environment Agency to better review the technical suitability of landspreading proposals submitted by an operator for a wider range of chemicals.

[News story: UKHO features in new UK Chamber of Shipping film](#)

Focusing on their role as the UK's hydrographic and marine geospatial agency, the film gives an insight into the vital role the UKHO played in the arrival of HMS Queen Elizabeth into Portsmouth. The UKHO analysed and verified bathymetric data about the depth and nature of the seabed to ensure safe passage.

It also explores their international responsibilities as the Primary Charting Authority for 71 nations. As well as charting these waters to support safe navigation, the UKHO helps small island states to sustainably manage their marine resources by helping them to build their knowledge of their marine environment. This work brings economic benefits and can help to build resilience to the impact of climate change and natural disasters.

More recently, the UKHO supported relief efforts in the Caribbean in the devastating wake of Hurricane Irma. By providing emergency navigational charts to the British Virgin Islands within 24 hours, this enabled ships to safely bring in emergency supplies.

The film demonstrates the wide range of location-based information the organisation handles from its office in Taunton, Somerset. Chief Executive John Humphrey explains:

Good marine information supports trade, tourism, civil defence, managing the marine environment. All of those different things require good information to be able to do them and we are the people who can provide that information.

By investing in new data capabilities and facilities, the UKHO is developing its world-class capabilities into the future.

You can view the UK Chamber of Shipping film below.

[‘Sea Change’ – The United Kingdom Hydrographic Office](#)

[News story: New UK projects look at the impact of spaceflight on the human](#)

body

By supporting this research, the Agency will enhance the UK's capabilities in space exploration and support areas that can lead to the development of new technologies.

The funding, from the Agency's Microgravity Science Programme, will help scientists with upcoming experiments in European Space Agency microgravity facilities, including the International Space Station and parabolic flights simulate the effects of gravity.

Libby Jackson, Human Spaceflight and Microgravity Programme Manager, said:

We are delighted to be supporting the growing microgravity science community in this research. These exciting experiments will further our understanding of how the human body copes with the challenging environment of living and working in space, which in turn will help humans to carry out more research in space.

The three projects, which have been awarded a total of £534,421, are:

Exploration Studentship: Molecular basis of muscle alteration in response to spaceflight – Professor Nate Szewczyk, University of Nottingham – £59,196

Professor Nate Szewczyk, from the University of Nottingham, is the Principle Investigator of the Molecular Muscle experiment, due to be flown to the International Space Station (ISS) on SpaceX-16 flight at the end of 2018. This grant will support a post-graduate student to work with the experiment team, receiving training in the conduct of molecular mechanistic experiments to further understand why muscle declines in response to spaceflight and, potentially, how it can be countered as well as gaining experience in the conduct of an actual life sciences spaceflight mission to the International Space Station.

The long-term goal of crewed missions to Mars poses technical challenges with respect to engineering appropriate spacecraft and associated subsystems as well as with preserving human health on long duration space missions. One of the potentially mission limiting health risks that has been identified for Mars missions is the decline of muscle strength and aerobic capacity. Over a number of years and spaceflight missions a consistent set of molecules has been identified that change in response to spaceflight and do so not only in astronaut muscle but also in other animals such as mice and worms. By conducting experiments in worms on Earth, researchers have found that they have been able to change the response of the molecules that change in response to spaceflight. Thus, they will now attempt to use these gene and drug therapies on board the International Space Station to see if they can alter the response of worm muscle to spaceflight.

Muscle Tone in Space – Professor Maria Stokes, University of Southampton – £191,892

Professor Maria Stokes, from the University of Southampton, is part of the international team behind the Myotones experiment, led by Professor Dieter Blottner, of the Charité Universitätsmedizin Berlin, which will take place on the International Space Station (ISS) in the coming years.

The tone of a resting muscle is affected by tissue called fascia, as well as the tissue within the muscle itself and these shape the human resting muscle tone (HRMT) system. Changes in the HRMT system and the effects on function due to microgravity have yet to be studied directly. This project aims to monitor muscle health of crew members by non-invasive, objective measurement of biomechanical properties of muscles pre-, in- and post-flight.

The two technologies used are Myoton and ultrasound imaging of musculoskeletal tissues. Ultrasound images will be used to measure muscle thickness to see how this changes over time, from pre-flight to inflight and post-flight periods. The MyotonPRO device offers a hand-held, user-friendly and non-invasive measurement method to test key biomechanical parameters of the superficial skeletal muscles, tendons and other soft biological tissues.

Development and evaluation of countermeasures to prevent spinal antigravity muscle deconditioning in simulated partial- and micro-gravity – Professor Nick Caplan, University of Northumbria, £283,333

Professor Nick Caplan and his team are working to mitigate injury risk and maintain operational effectiveness in astronauts by understanding how spinal anti-gravity muscles are affected by reduced gravity, and how their condition can be preserved by artificial gravity exposure or recovered through exercise. This will be done through participation in the International Space Life Sciences Working Group parabolic flight campaign (2018) and the NASA/ESA Artificial Gravity Bedrest Study (2018-19) using techniques that they have developed to assess the role of these muscles during postural control in low back pain. Working in partial gravity conditions (e.g. Moon and Mars) will lead to musculoskeletal deconditioning in astronauts that will increase spinal injury risk and reduce operational effectiveness, risking mission failure. This study will demonstrate how partial gravity influences spinal antigravity muscle activity and spinal postural control. This knowledge will enable effective countermeasure development for long duration human habitation of Moon and Mars.

[Impact assessment: UK Offshore Energy](#)

Strategic Environmental Assessment 3: supporting documents

Supporting documents for UK Offshore Energy Strategic Environmental
Assessment 3